

SMALL SCIENCE

A series in
primary science

WorkBook Class 4

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Based on the theme 'Watch, listen, do and think!', the cover depicts a young girl,
Mini, watching the full moon rise over a rice field.

The neologisms 'TextBook' and 'WorkBook' are indicative of the
innovative and distinct approach of *Small Science*.

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GENERAL PREFACE

The Homi Bhabha Centre for Science Education (HBCSE) has been active in research and field work since 1974. Interdisciplinary scholarship at the Centre has been developed around a doctoral program in Science Education. As one outcome of this research and development, about ten years ago, textbooks, workbooks and teacher's books in primary science were brought out by HBCSE.

The books received warm and appreciative response from all quarters - teachers, students, parents, professionals and also Government agencies. At the time of first publication some of the ideas in these books appeared radical and unconventional. Today these ideas have become part of the discourse of education in our country. We are therefore very happy that the Oxford University Press has taken on itself the job of publishing and distributing these books on a much wider scale.

The National Curriculum Framework 2005 has prepared five guiding principles for curriculum development: connecting knowledge to life outside the school; ensuring that learning shifts away from rote methods; enriching the curriculum so that it goes beyond textbooks; making examinations more flexible and integrating them with classroom life; and nurturing an overriding identity informed by caring concerns within the democratic polity of the country. Often however there remains a gap between the generally agreed objectives of the curriculum and their actual translation into textbooks and teaching practices.

The books brought out by HBCSE reflect an attempt to close this gap as much as possible. It is for the users of these books to decide if this attempt has been successful.

Arvind Kumar

PREFACE TO SMALL SCIENCE CLASS 4

The Small Science books have emerged out of a process of research, field-work and classroom trials. Their activity-based approach is based on the idea that first-hand concrete experiences at an early age gradually strengthen the child's capacity to construct abstract formulations. Curriculum units are therefore developed around simple, cognitively and contextually appropriate, activities and exercises which help children explore and understand the world around them.

Small Science discourages memorisation of text, focusing instead on acquisition of tools of learning: namely, observation, design drawing and construction, along with basic scholastic skills of speaking, reading, writing and calculating.

The books interweave a story about two curious children, Mini and Apu, who learn many things by observing, doing, inquiring and reflecting on their experiences. Questions stimulate students to observe and think beyond the book, while stories and poems enliven their reading. The WorkBook lays out a format for recording results of the activities and exercises. The same format enables continuous assessment of the student's work.

The Teacher's Book provides conceptual guidance and practical hints. Much effort has gone into providing the teacher with background information relevant to the Indian socio-cultural, geographical and natural-historical context. Results of classroom trials too are conveyed through first-person accounts in the Teacher's Book.

These books are supplemented by a Teacher's Book in Environmental Studies for Classes 1 and 2 which is available from the Homi Bhabha Centre for Science Education (HBCSE), Tata Institute of Fundamental Research, Mumbai.

Do write and tell us if you liked the books; and please send us your ideas for improving them.

Jayashree Ramadas

Teacher support: smallscisupport@hbcse.tifr.res.in

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I would like to thank:

Arvind Kumar who initiated the Homi Bhabha Curriculum and gave constant encouragement and guidance

Suchitra Varde who conscientiously tested the activities and exercises

The principals, staff and students of the Children's Aid Society, Nutan Vidya Mandir and the Atomic Energy Central Schools, Mumbai, and Vivek High School, Chandigarh, who enthusiastically participated in the trials

Karen Haydock who did the design and illustrations, contributed many good ideas and gave interesting feedback from the classroom

Children of Village Titaram, Kaithal Dist., Haryana, the Atomic Energy Central Schools, Mumbai, and Vivek High School, Chandigarh, who contributed some wonderful pictures

Members of HBCSE who clarified my doubts: Anand Ghaisas, Ashwini Kanhere, R. S. Korgaonkar, Rekha Vartak, Sandhya Thulasidas, Savita Ladage, V. G. Gambhir and V. N. Purohit; and those who also gave valuable suggestions on the draft versions: Bakhtavar Mahajan, Chitra Natarajan, G. Nagarjuna, Jyotsna Vijapurkar, K. Subramaniam, Poornima Burte and Sugra Chunawala

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The School of Mathematics, TIFR, who allowed use of their computer facilities

My daughter Rohini, son Harishchandra and many good friends, who were so supportive during some difficult times.

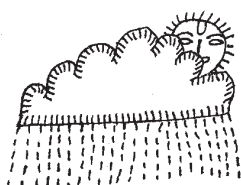
Jayashree Ramadas

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UNIT 1

SKY AND WEATHER



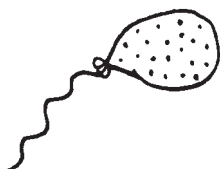
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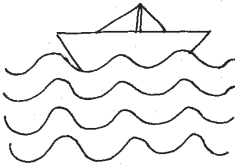


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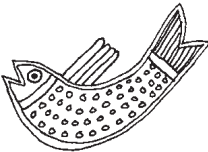


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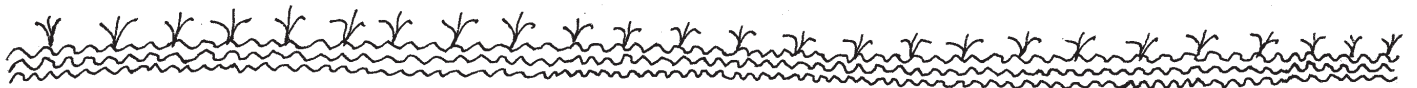
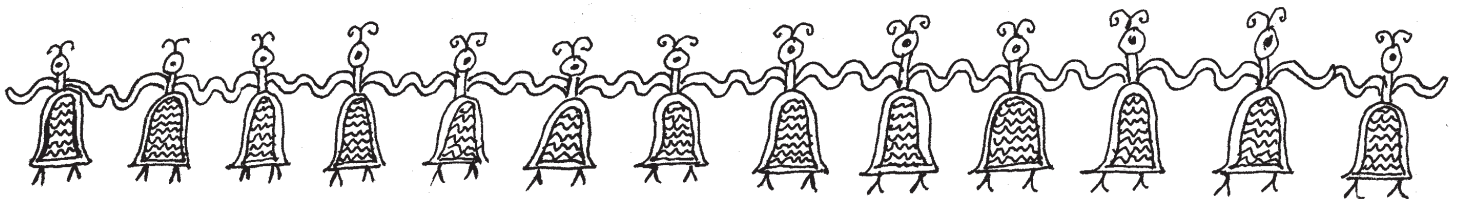
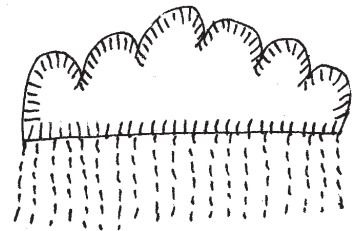
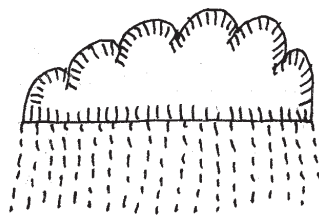
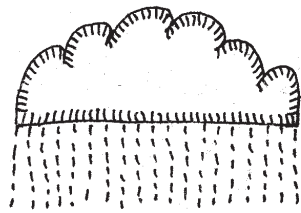
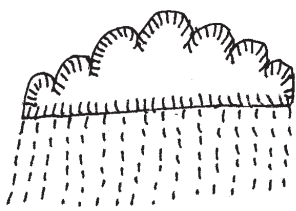
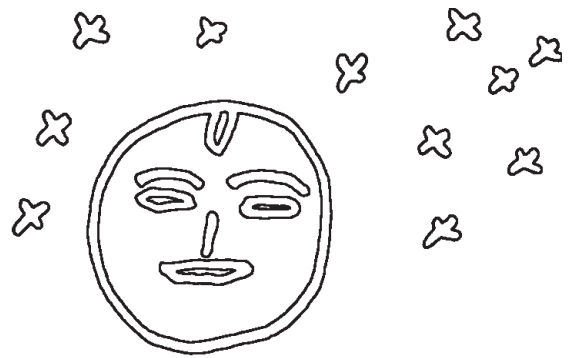
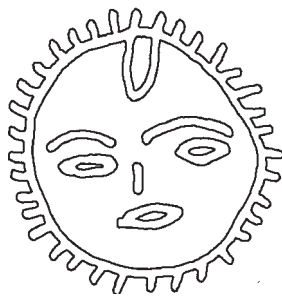


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UNIT 1

SKY AND WEATHER

Chapter 1

Sun, wind, clouds and rain

Chapter 2

Day sky, night sky

Assessment Sheet: Unit 1

Category	Score	Comments
Observation	O	
Understanding	U	
Oral Language (Talking)	T	
Written Language (Writing)	W	
Design Skills	D	
Quantitative Skills	Q	

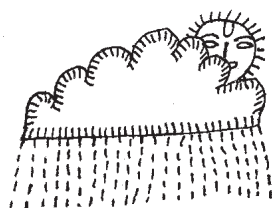
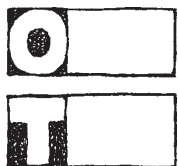
Enthusiasm in doing activities

Patience and concentration

Independent thinking

Co-operation with other students

Completion of home assignments



SUN, WIND, CLOUDS AND RAIN

Watching the weather

1. The weather (TextBook page 4)

a. Look out of the window and answer these four questions:

- (i) Is the sky cloudy or clear?
- (ii) Is it warm or cold?
- (iii) Is it windy or calm?
- (iv) Is it rainy or dry?

Was yesterday's weather similar or different?

.....

Anything else you want to say about the weather today?

.....

b. Title of your story:

2. Weather calendar (TB p. 4)

a. Here's how to fill in the weather calendar for the month:

- (i) Write the year and the month.
- (ii) Fill in the dates for this month.

b. Describe today's weather. Use words like:

sunny	no clouds	a few white clouds
many clouds	overcast	sky covered with gray clouds
no rain	some rain	heavy rain
warm	cool	thunder-storm
windy	calm	drizzling rain
humid	dry	extremely hot

Note any special event (such as a holiday, festival, or a school function)

Thu	10 School function!	
	9.30	partly cloudy, warm
		not windy
	2pm	clear, hot, humid

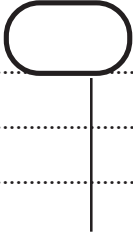
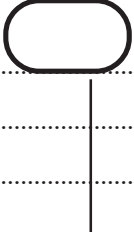
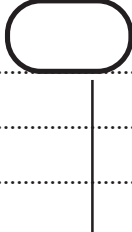
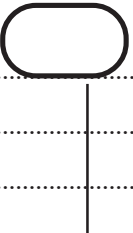
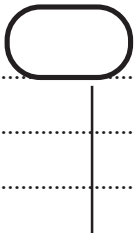
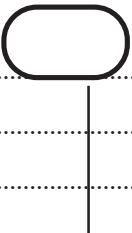
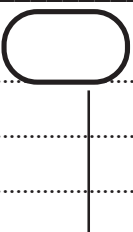
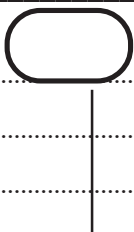
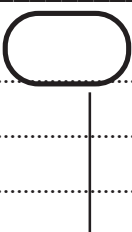
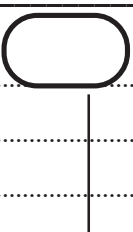
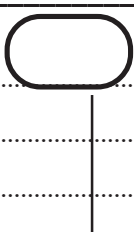
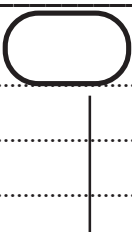
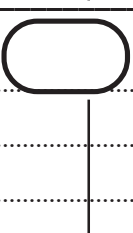
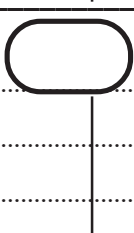
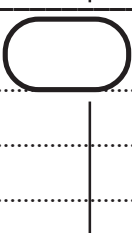
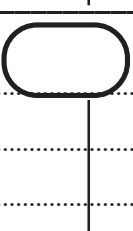
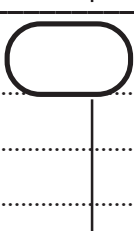
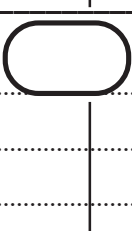
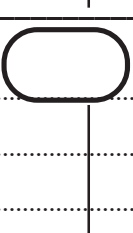
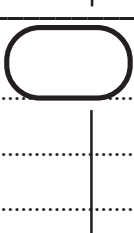
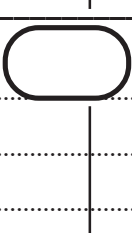
An example of how to fill in one day's data

Monthly Weather Calendar (TB p.4) Month Year.....

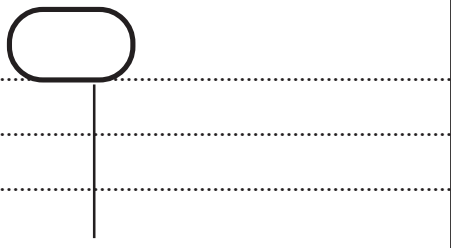
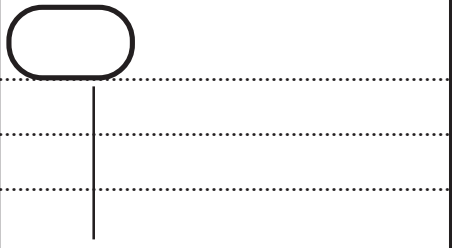
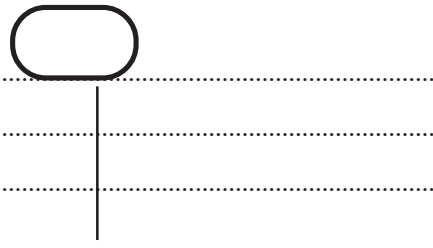
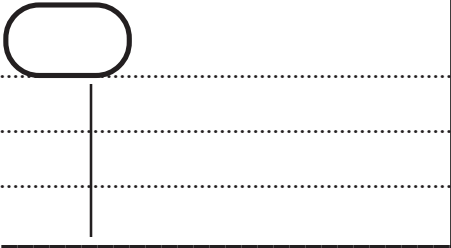
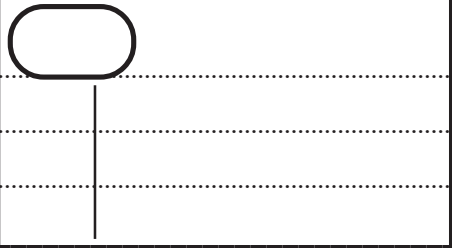
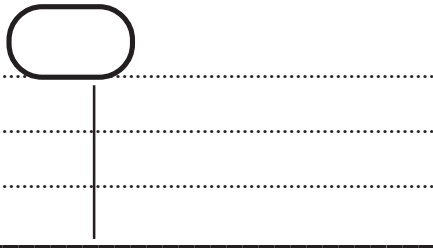
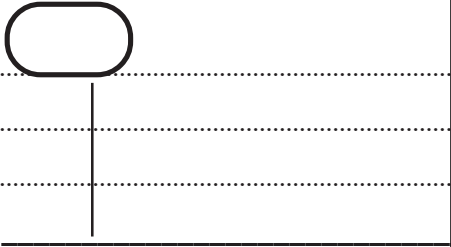
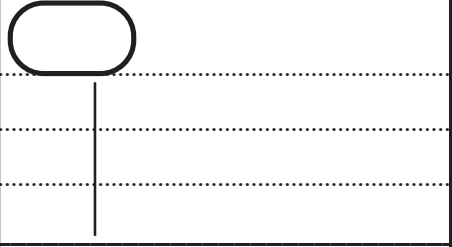
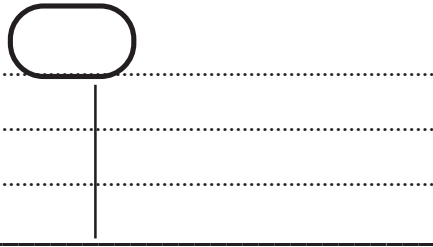
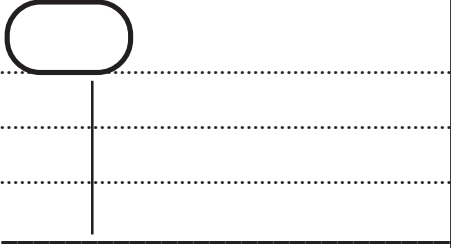
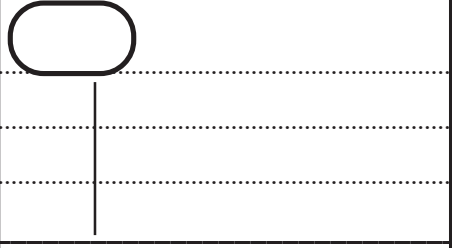
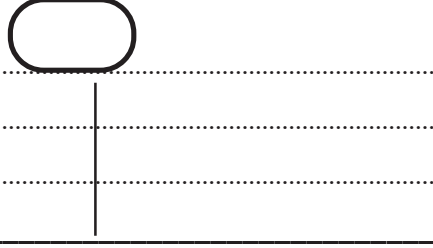
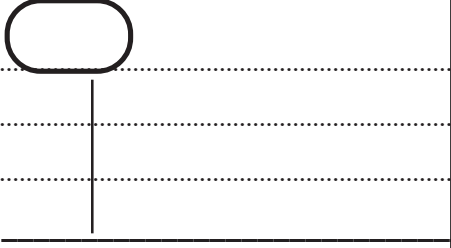
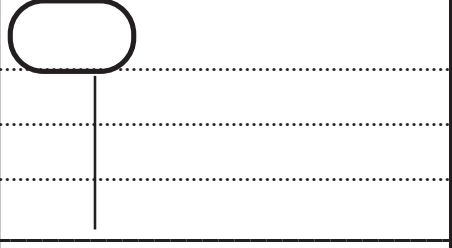
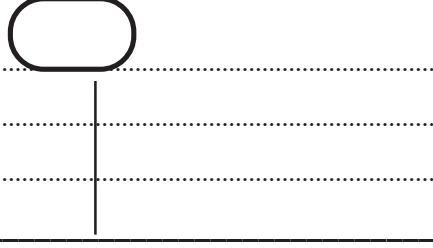
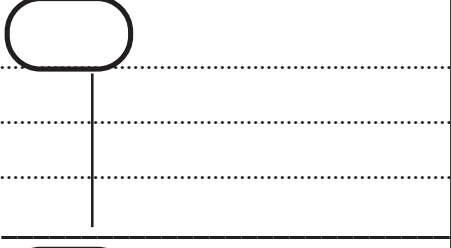
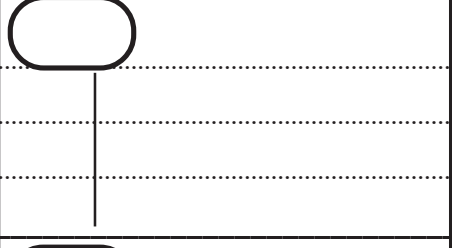
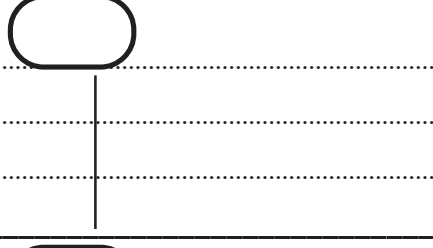
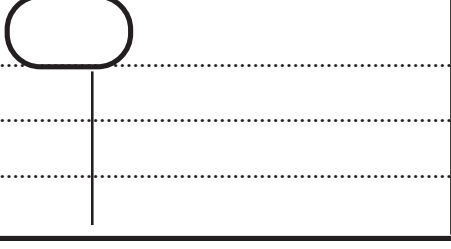
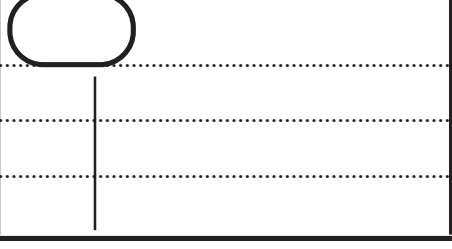
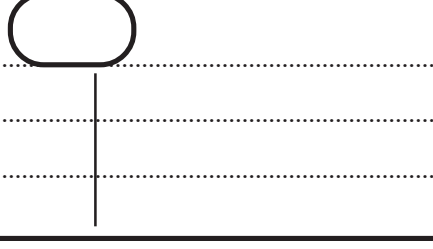
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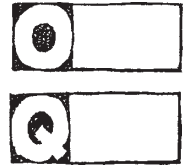


Sun		
Mon		
Tue		
Wed		
Thu		
Fri		
Sat		

Sun		
Mon		
Tue		
Wed		
Thu		
Fri		
Sat		



3. Warm or cold (TB pp. 4-5)

a. If you have a thermometer, fill this Table:

Date	Time	Temperature

What is the unit of temperature?

On the thermometers in the graph show the temperatures that Apu measured.
The thermometer for 6 am is already shaded for you.

<u>Time</u>	<u>Temperature (degrees Celsius)</u>
6:00 am	8°
9:00 am	12°
12:00 pm	20°
3:00 pm	24°
6:00 pm	21°
9:00 pm	18°
12:00 am	15°
3:00 am	11°

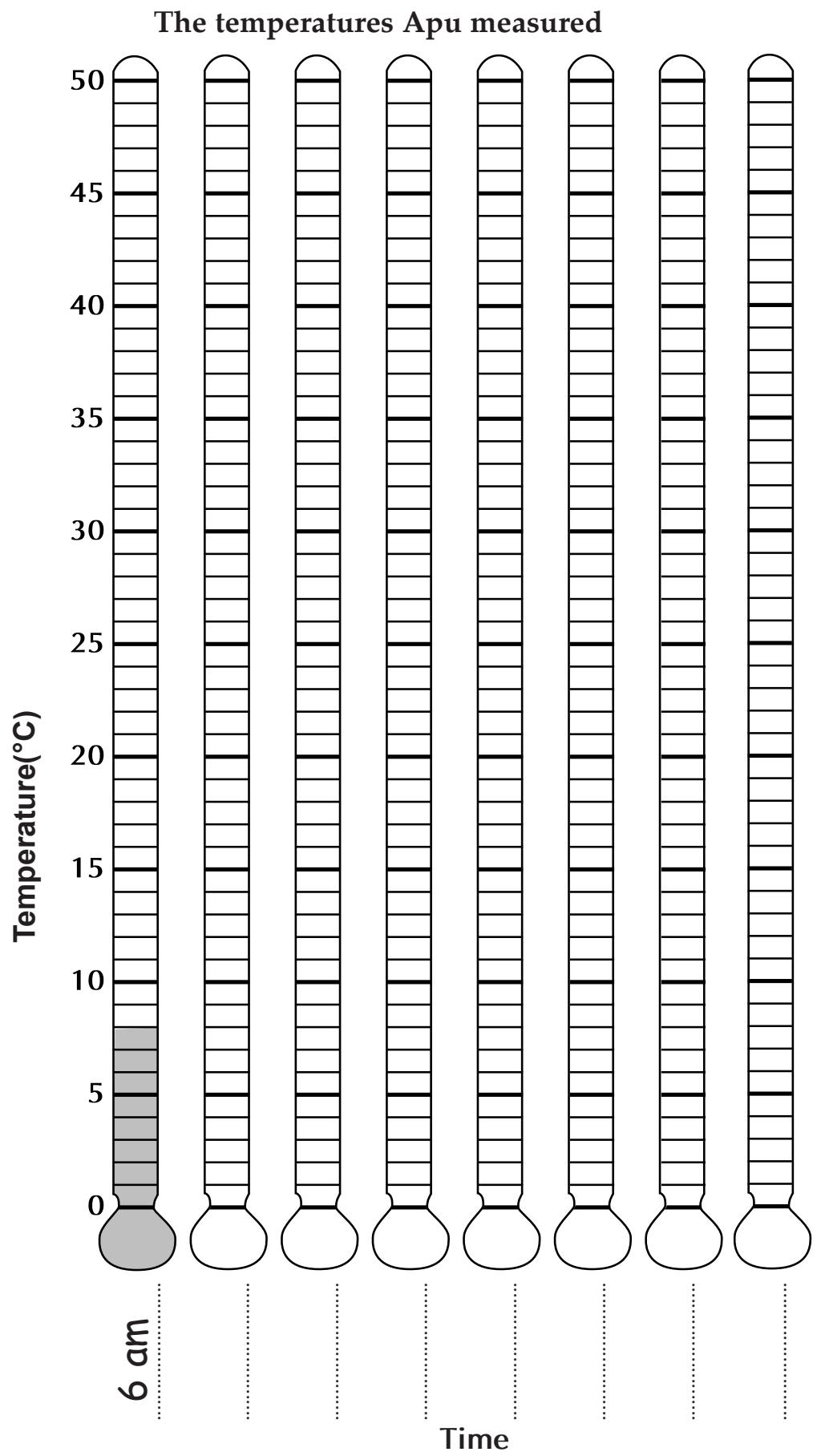
Did the temperature change through the day?

At what time was the maximum temperature measured?

At what time was the minimum temperature measured?

D

Q

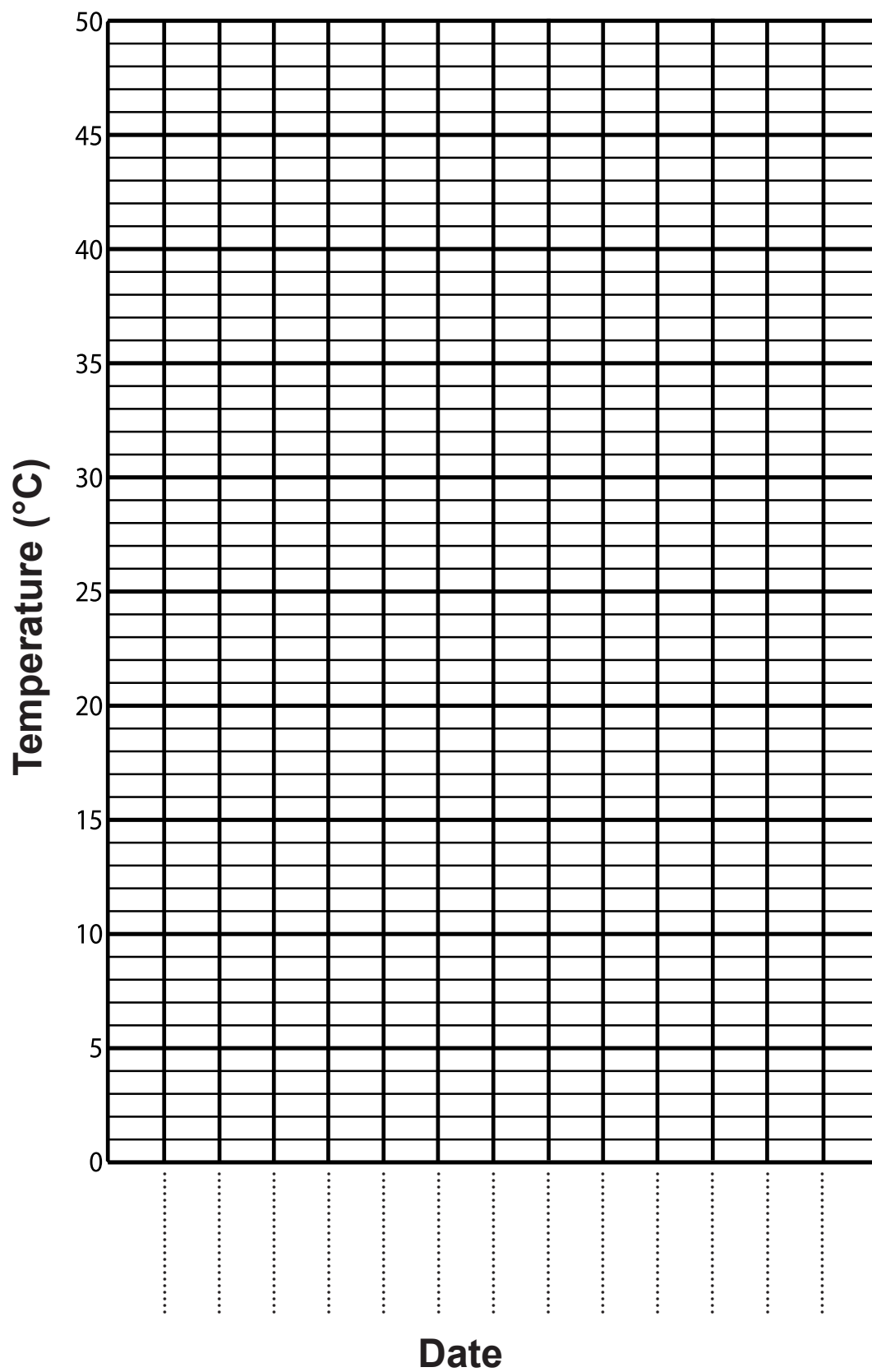




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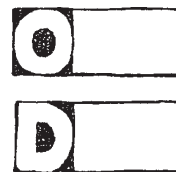
Maximum Temperature Graph



4. Which way the wind blows (TB pp. 5-6)

a. Crush a small piece of dry leaf. Throw up the pieces and see which way the wind is blowing.

b. A picture of the wind vane that I made:



The arrow pointed:

- ☐ in the direction the wind was going
- ☐ in the direction the wind was coming

Show the direction of the wind in your picture above.

The wind was coming from the.....(direction).

5. The wind makes waves (TB p. 7)

A picture of the waves I made:

O

W

D

6. Sky and clouds (TB p. 7)

Date and time:.....

Date and time:.....

Words to describe:

Words to describe:

the clouds.....

the clouds.....

the sky.....

the sky.....

Date and time:.....

Date and time:.....

Words to describe:

Words to describe:

the clouds.....

the clouds.....

the sky.....

the sky.....

Think! Think!

What do you think clouds are made of?

.....

What makes clouds move in the sky?

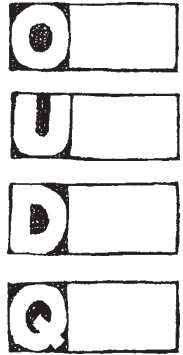
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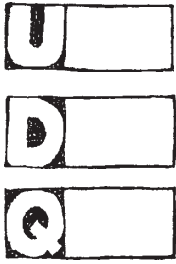
7. Measure the rain (TB p. 8)

a. A picture of our rain gauge:

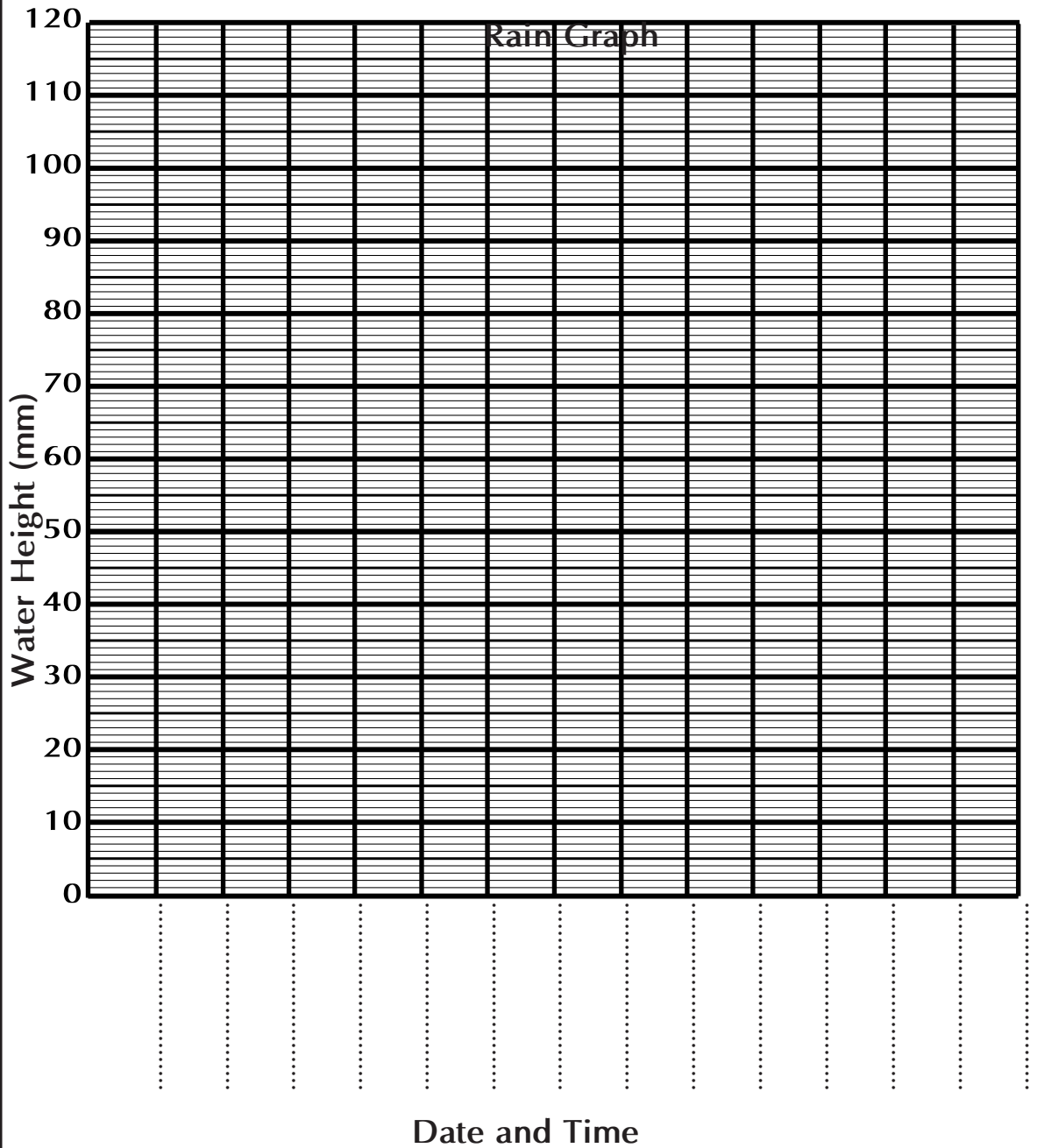
Date and time when our rain gauge was put outside.

Date/Time	Water level (mm)





Shade the graph to show the daily water level in your rain gauge.



Did the water level remain unchanged on any day?

.....

Did the water level decrease on any day? Guess why.

.....

Was the change in water level about the same in every group's container?



8. Humid or dry? (TB p. 9)

a. Tick one:

☐ I think these days were humid (write the dates):

.....

☐ I did not find any humid days.

b. Tick one:

☐ I think these days were dry (write the dates):

.....

☐ I did not find any dry days.

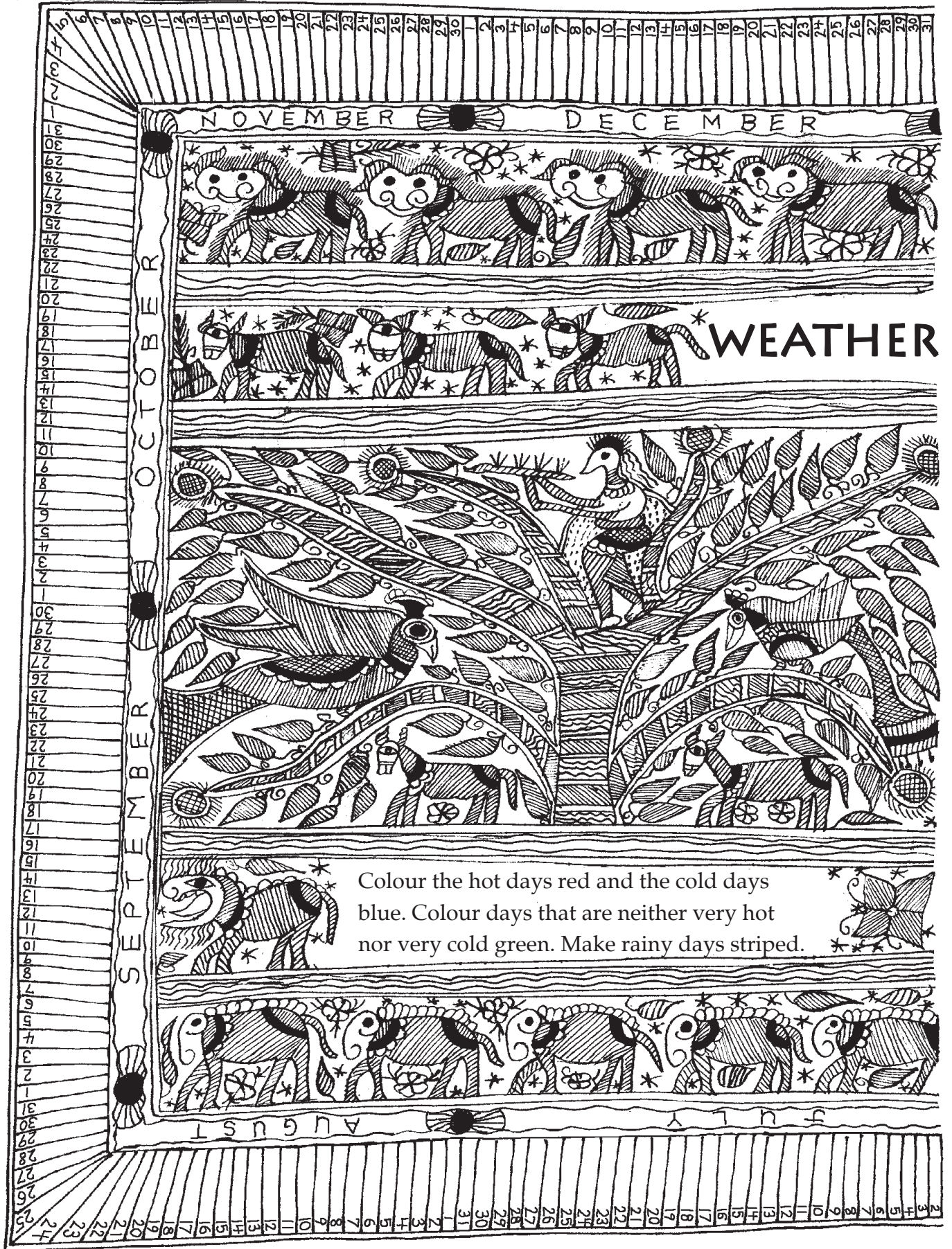
Exercises

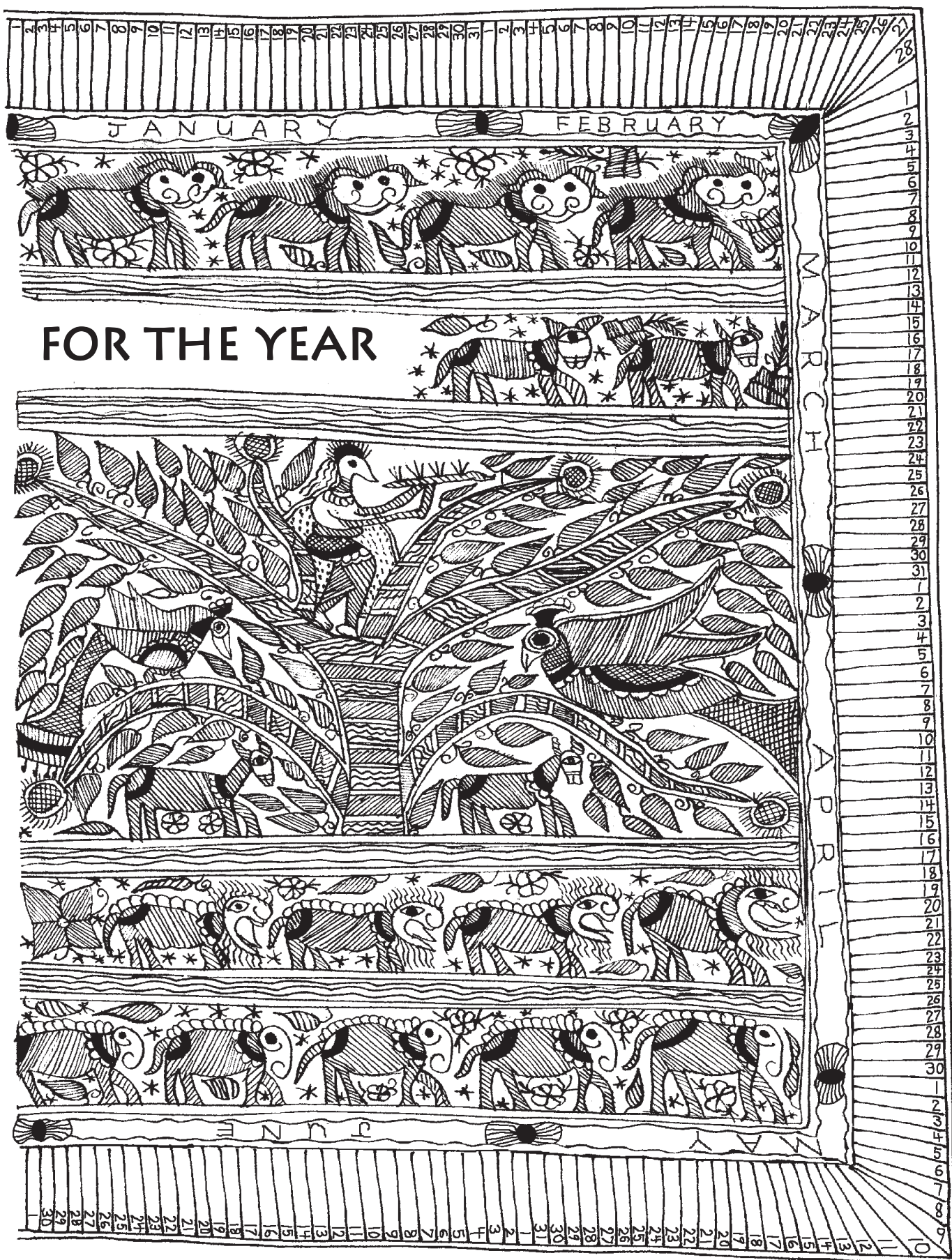
Name and draw

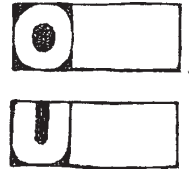
1. Rain



2. Colours of the rainbow







Interesting questions

Answer questions 1-4 at the end of the year, after completing the chart on pages 18-19.

- 1. In which months of the year do you have winter?
- 2. In which months of the year do you have summer?
- 3. In which months of the year do you have a rainy season?
- 4. In which months do you have school sports, outings or picnics? Why?
- 5. List some flowers, fruits, and vegetables that we get in summer (kharif) and in winter (rabi).

Summer (kharif)

Months:

Flowers:

.....		
.....		
.....		

Fruits:

.....		
.....		
.....		
.....		

Vegetables:

.....		
.....		
.....		
.....		



Winter (rabi)

Months:

Flowers:

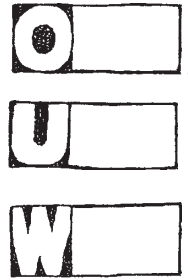
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Fruits:

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Vegetables:

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6. On what kind of day (hot, cool, cold, wet, etc.) would you wear clothes made out of: cotton, tericot, nylon, wool or plastic?

Type of day	Type of materials we could wear
.....	
.....	
.....	
.....	
.....	
.....	

7. Which of these things happen when the temperature is low? (tick)

- ☐ butter is soft
- ☐ you feel cold
- ☐ you sweat a lot
- ☐ coconut oil becomes solid
- ☐ you wear thin clothes

8. Write down some things that happen on a very hot day.

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9. Write down some things that happen on a rainy day.

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10. Which of these things would you **not** do on a rainy day? (tick)

- ☐ swim in a river
- ☐ graze the cattle
- ☐ write a letter
- ☐ play outdoors
- ☐ do some cooking
- ☐ wash a lot of clothes

11. Which of these things happen best on a windy day? (tick)

- ☐ boats sail
- ☐ rivers flow to the sea
- ☐ windmills work
- ☐ cloths dry faster
- ☐ birds fly

12. Name some ways in which wind is useful to us.

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.....

13. Name some things that happen in a storm.

.....

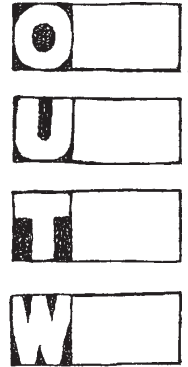
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14. In what kind of weather is it dangerous for fishermen to go fishing in the sea?

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Classroom discussion

1. Which time of the year do you think has the best weather? Why do you think so?

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2. How do different animals behave on a very hot or a very cold day? Are they quiet or active? Do they look for shelter?

Hot day:

.....

.....

.....

.....

Cold day:

.....

.....

.....

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3. What is a flood? Have you or your parents seen a flood? Have you heard of floods in other places? When and where did these floods take place? What were the reasons for the floods? What happened then?

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4. What is a drought? Have you or your parents experienced a drought? Have you heard of droughts in other places? When and where did these droughts take place? What were the reasons for the drought? What happened then?

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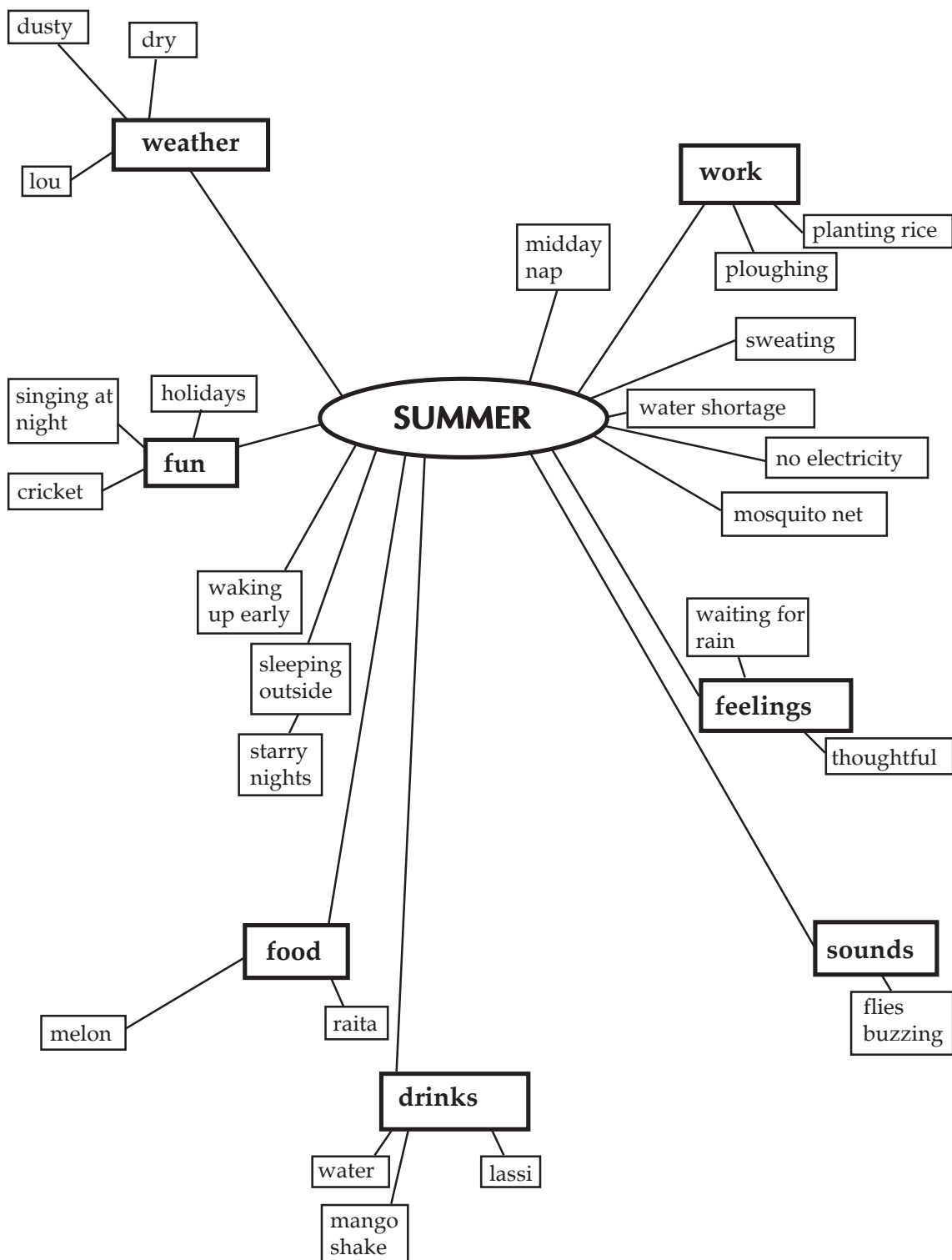
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What's the same? What's different?

1. Complete this chart for your own kind of summer.

Make any additions and changes you want.



O

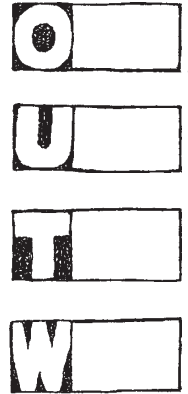
U

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D

Now make your own chart for winter .

WINTER



Talk and write

1. Write your own poems or songs about any of the seasons. You need **not** make your poems rhyme.

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2. Describe a thunderstorm to your friend. Answer the questions which your friend asks about the thunderstorm.

Play with words

1. Words which mean 'wind':

.....

Arrange the following words from **weak wind** to **strong wind**:

gale cyclone breeze storm

.....

2. Find words for these

Light, fine rainfall

Pieces of ice that fall with rain

Fluffy frozen water from the sky

The rainy season

The sound with lightning



3. Match each day with what happens on that day:

Rainy day

Hot day

Cloudy day

Foggy day

No shadows

You cannot see very far

Clothes take long to dry

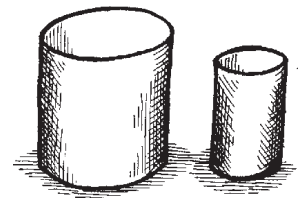
Ghee flows easily

Ask and find out

1. In which different months of the year do farmers sow seeds? Why?
2. Find out what the weather is usually like on any five festival days celebrated in your area.
3. What is **lou** (लू) and **aandhi** (आंधी)? Find out words in your own language to describe unusual weather conditions.

Figure it out

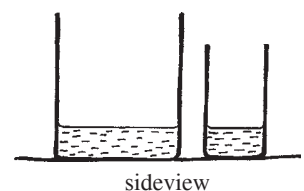
1. Suppose you have two containers, one wide and the other narrow. Both have upright sides. You keep them together out in the rain. Would the height of the water collected in both containers be the same or different? Why?



.....

.....

2. Suppose both containers have water up to a height of one centimetre. Would the amount of water in them be the same or different?



.....

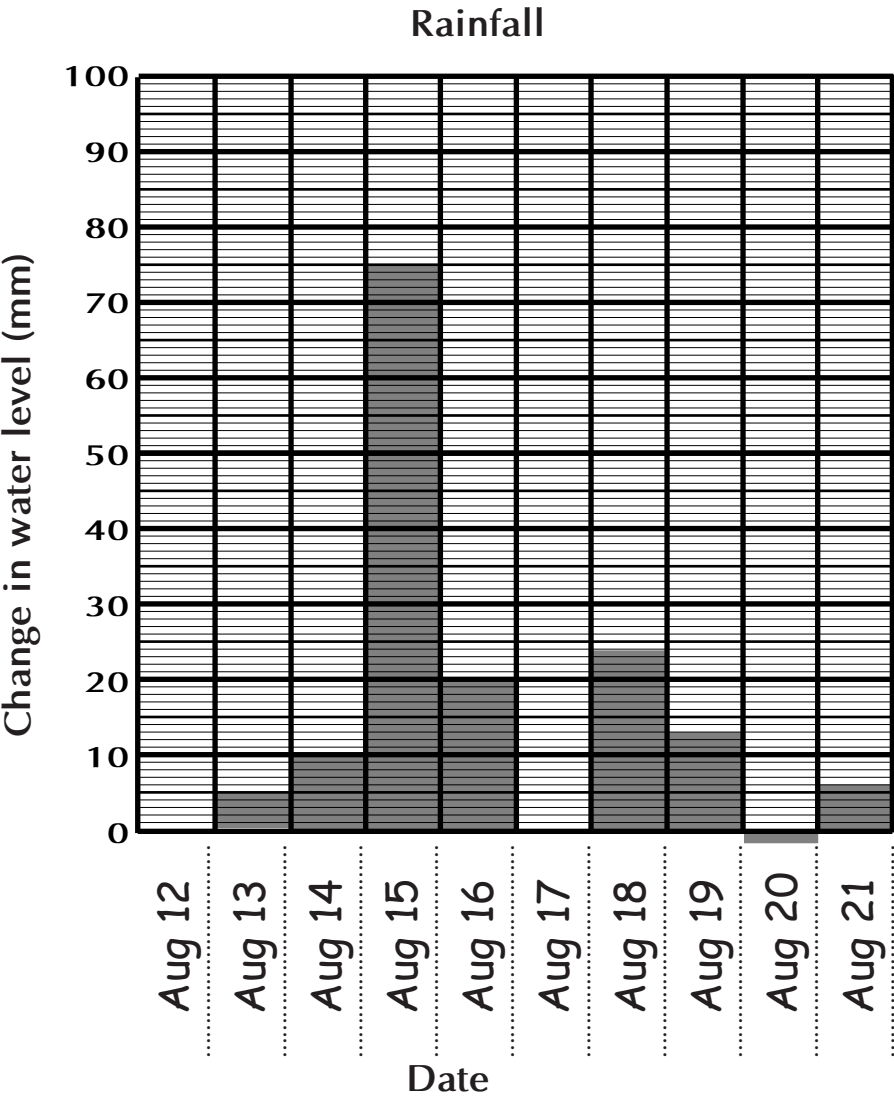
.....

3. Suppose you kept two identical containers: one on the terrace and one in the open ground. Would they collect the same or different amounts of water?

.....

.....

4. Mini and her friend Varsha set up their rain gauge on August 11 and measured the rainfall for ten days. They got this graph.





Use the graph to answer these questions:

- a. How much change in water level did they find on Aug 12?
 - b. How much rain did they record on Aug 13?
 - c. How much rain did they record on Aug 14?
 - d. On which days did they record 24 mm of rain?
 - e. On which days did they record the most rain?
 - f. On which days did they record the least rain, or none at all?
 - g. What do you think happened on Aug 20?
.....
 - h. How much did it rain between Aug 11 and Aug 21?
 - i. On which days did they record 6 mm of rain?
5. The weather chart - see next page

Show and tell

1. Bring something that you can find only during a particular season or time of year. Show it to the class and tell about it.

What I bought:

Ask a question

Ask questions about the weather.

My questions:

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Q

5. Mini, Varsha and Khurshid made the weather calendar on page 33 for two weeks in August. Then they made this diagram to show which days had sunshine and which days did not.

Cut out the date boxes in the calendar.

- a. Sort these date boxes into two piles: **dates with sunshine** and **dates with no sunshine**.

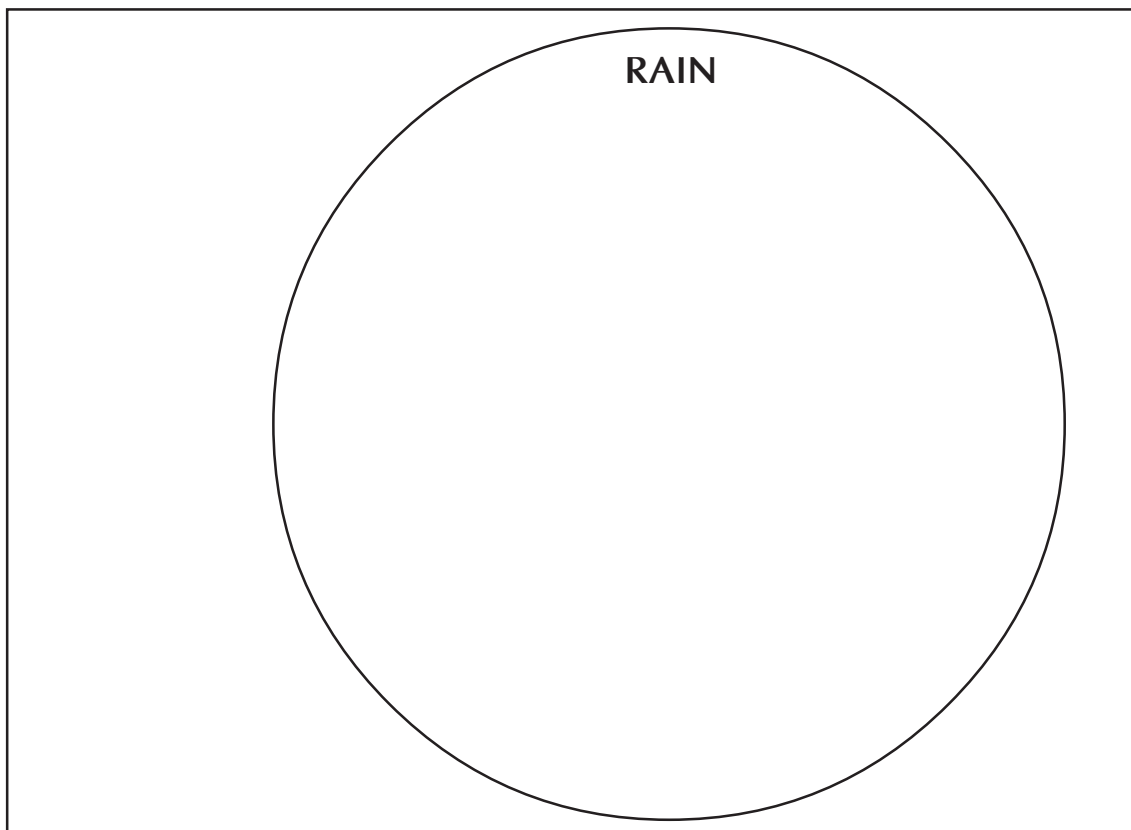
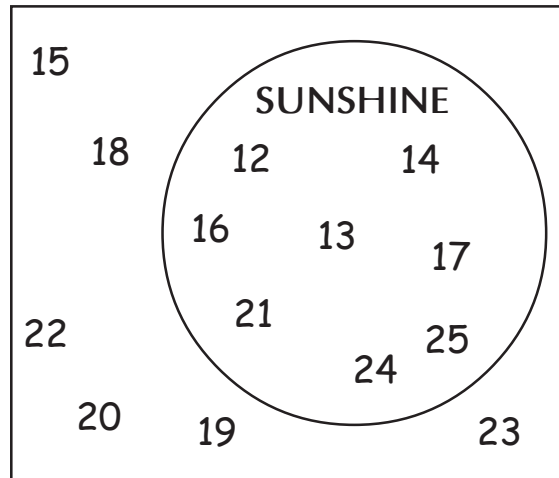
Did Mini and her friends make any mistakes in this diagram?

Why did they put 18 and 23 outside the circle?

.....

- b. Now sort the date boxes into these two piles: **dates with rain** and **dates without rain**.

In the following diagram, write the dates with rain inside the circle. Write the dates without rain outside the circle.



Sun	12	sunny	19	8-11	rain
					no sun
Mon	13	sunny all day	20		cloudy all day
Tue	14	9am sunny 3pm rain	21	9am sunny 3pm rain	
Wed	15	No school no sun rained all day	22	cloudy 9pm rain	
Thu	16	sunny, hot all day	23	no rain cloudy	
Fri	17	lost my chappal! 7am rainy 2pm sun came out	24	flew kites bright sun windy	
Sat	18	overcast no rain	25	rained while the sun shone!	





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c. Take the date boxes that have **rain** and sort them into two piles: **dates with rain but no sunshine** and **dates with both rain and sunshine**.

Now think! Where will you write these dates in the following diagram?

d. Now take the date boxes that have **no rain** and sort them into two piles: **dates with sunshine and no rain**, and **dates without sunshine or rain**.

Put all these dates in the correct parts of this diagram.

